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ABSTRACT

The present study was designed to assess kindergarten, second-, and fourth-graders' knowledge of two aspects of metamemory, the effect of list length and the effect of study time, and to relate this knowledge to the children's performance on recall tasks. One hundred and eight elementary school children, 36 from each grade level, were shown pictures in three decks of cards of varying size (5, 10, and 15 items). The pictures, consisting of black and white line drawings of common objects were shown two at a time, and children were asked to predict which deck in each pair would take more (or less) time to learn and why. After making their predictions, children were given picture sets of different lengths to study, one at a time, and were then administered a recall test. There were no significant differences among grades in the ability to predict the relative study periods required to learn the three lists. In addition, children at all grade levels increased their study time with increasing list length; fourth-graders studied significantly longer on the 10- and 15-item lists than did kindergartners and second-graders. Finally, there was a significant relationship between prediction and performance at all grade levels. (Author/RH)

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Abstract

Recent studies of the knowledge that one possesses of the functioning of one's memory (metamemory) have indicated that in certain situations metamemory and performance coincide, whereas in other situations there is a discrepancy between what children say and what they do. In contrast to most research, the present study attempted to relate metamemory and performance directly.

Specifically, the study was designed to assess kindergarten, second-, and fourth-graders' knowledge of the effect of list length and the effect of study time, and to relate this knowledge to performance. Children were shown pictures in three decks of cards of varying length (5, 10, and 15 items), two at a time, and asked to predict which deck in each pair would take more (or less) time to learn and why. Children were then given sets of pictures of each list length to study, one at a time, followed by a recall test. There were no significant differences among grades in the ability to predict the relative study periods for the three list lengths. In addition, children at all grade levels increased their study times with increasing list length. Finally, there was a significant relation between prediction and performance at all grade levels.

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Children's Understanding of the Relation Between List Length and Study Time: A Study of Metamemory. Jeffrey K. Dowler, Wayne State University, and Judith P. Allik, University of Dayton. Presented at MPA, St. Louis, May 1 - 3, 1980.

INTRODUCTION

Recent studies of the knowledge that one possesses of the functioning of one's memory (metamemory) have indicated that in certain situations metamemory and performance coincide, whereas in other situations there is a discrepancy between what children say and what they do. In general, researchers have examined metamemory and performance separately, and have inferred knowledge (metamemory) from performance. The present study attempted to relate metamemory and performance directly.

Specifically, the present study was designed to assess kindergarten, second-, and fourth-graders' knowledge of two aspects of metamemory, the effect of list length and the effect of study time, and to relate this knowledge to performance. Children were shown pictures in three decks of cards of varying length (5, 10, and 15 items), two at a time, and asked to predict which deck in each pair would take more (or less) time to learn and why. After making their predictions, children were given sets of pictures of each list length to study, one at a time, followed by a recall test. There were no significant differences among grades in the ability to predict the relative study periods for the three list lengths. In addition, children at all grade levels increased their study time with increasing list length; fourth-graders studied significantly longer on the 10- and 15-item lists than did kindergartners and second-graders. Finally, there was a significant relation between prediction and performance at all grade levels.

METHOD

Subjects

The subjects were 108 elementary school children, 36 from each of kindergarten, second-, and fourth-grades. There were 18 boys and 18 girls from each grade. All children were in the grade appropriate for their age.

Stimuli

The stimuli were 60 black and white line drawings of common objects on 10.16 × 10.16 (4 x 4 inch) cards. Two sets of cards were used (Set A and Set B) to avoid repetitions. Each set consisted of decks of cards of varying list length: 5, 10, and 15.

Procedure

The study was divided into two phases, Prediction and Performance. The two phases occurred in the same order for all children. Each child was tested individually.

Prediction phase. Children were each given all possible combinations of the list lengths, two at a time, and were asked to predict which deck in each pair would take more (or less) time to learn. Children were also asked to explain the rationale for their judgments. Additional instructions were given when necessary. Each child was asked to make three list length comparisons. Following the third comparison, the second phase was begun.

Performance phase. During this phase each child received one set of cards to study, one deck at a time. One half of the children received Set A to study and the other half received Set B.

The performance task was presented in the form of a memory game. Each child was given a deck of cards and asked to "study these pictures very hard

until you think you can remember every one ..." Additional instructions were given when necessary. When the child indicated readiness, the cards were covered and the child was asked to recall as many pictures as possible. Each child was allowed as much time as necessary for recall. The experimenter recorded the time spent studying and the words recalled. The procedure was continued in the same manner for the second and third decks. After the completion of the third study-recall trial, the child was thanked for helping the experimenter and returned to class.

RESULTS

Predictions and actual study times were rank-ordered from shortest to longest for each child. Three comparisons were made: predictions vs. theoretical (i.e., 5, 10, and 15), performance vs. theoretical, and prediction vs. performance.

Rank-order correlation coefficients (Kendall's Tau-c) were computed on the three comparisons for each grade. First, there is a significant rank-order correlation between the predicted rank-orders and the theoretical model for all grades, Tau-c = .77 (n = 36), .90 (n = 35), and .92 (n = 35), all ps $< .001$, for kindergarten, second- , and fourth-grades respectively. Chi-square analyses revealed that there is a significant difference between the number of correct (n = 90) and incorrect (n = 16) predictors, X^2 (I) = 50.27, $p < .001$. In addition, there are no differences among grades in the number of correct predictors (see Table 1).

Secondly, there is a significant rank-order correlation between the actual study times and the theoretical ranking, Tau-c = .60 (n = 36), .67 (n = 36), .83 (n = 36), all ps $< .001$, for kindergarten, second-, and fourth-

grades respectively. Chi-square analyses revealed that a significant number of children increased their study times with increasing list length, X^2 (I) = 47.23, $p < .001$. In addition, a significantly greater number of fourth-graders than kindergartners increased their study times across the three list lengths, X^2 (I) = 4.00, $p < .05$ (see Table 1).

Finally, a rank-order correlation between the predictions and actual study times revealed that there is a significant correlation between prediction and performance at all grade levels for those children who correctly predicted the relative amount of time required for the three list lengths in the Prediction Phase, Tau-c = .56 (n = 29), .65 (n = 30), and .83 (n = 31), all ps < .001, for kindergarten, second-, and fourth-graders respectively (see Table 2). However, of these correct predictors (n = 90), a significant number (n = 32) did not adhere to the theoretical model during performance, X^2 (I) = 21.78, $p < .001$.

Figure 1 presents the mean study times for the three list lengths by grade level. A 3 (grade) x 3 (list) mixed analysis of variance was computed on the study times with list as the within-subjects variable. The main effect of grade was not significant, $F(2,104) = 2.37$, $p < .05$, whereas the main effect of list was significant, $F(2,208) = 78.06$, $p < .001$, as well as the Grade X List interaction, $F(4,208) = 2.86$, $p < .05$. A post-hoc Dunn test revealed that fourth-graders studied significantly longer on the 10- and 15-item lists than second-graders and kindergartners ($p < .01$).

Figure 2 presents the mean number of words recalled from each list by grade level. A 3 (grade) x 3 (list) mixed analysis of variance revealed a significant main effect of grade, $F(2,108) = 45.00$, $p < .001$, a significant

main effect of list, $F(2,210) = 73.16$, $p < .001$, and a significant Grade x List interaction, $F(4,210) = 7.64$, $p < .001$. A post-hoc Dunn test revealed that fourth-graders recalled significantly more words from each list than kindergartners ($p < .001$), and significantly more words from the 10- and 15-item lists than second-graders ($p < .01$). In addition, second-graders recalled significantly more words from the 10- and 15-item lists than did kindergartners ($p < .01$).

DISCUSSION

The present study was designed to assess children's knowledge of two aspects of metamemory, the effect of list length and the effect of study time, and to relate this knowledge to actual performance. Specifically, it was predicted that the accuracy with which children would predict the relative amount of study time required for the three list lengths in relation to the theoretical model would increase with increasing grade level. Both the correlation between predictions and the theoretical model, as well as the frequency of children who predicted correctly were significant at all grade levels. In addition, the correlation increases with increasing grade level. Simply, children in kindergarten, second, and fourth grades demonstrated knowledge of the relation between list length and study time. The present findings suggest that young children have a better understanding of how list length and study time are related than previous research has shown: kindergartners predicted the relative amount of study time required for the three list lengths as well as the fourth-graders.

A major purpose of the present investigation was to examine the relation between metamemory and performance. It was predicted that the second- and

fourth-graders would demonstrate a relation between study period prediction and performance, whereas kindergartners would not. The rank-order correlation between the children's predictions and the actual study periods was significant at all grade levels; however, this correlation did increase with grade level. On the other hand, of the correct predictors, a significant number did not follow the theoretical model during performance.

Researchers (e.g., Brown, 1978; Wellman, 1977) have stressed the importance of relating metamemory to performance. In view of the present findings, it appears that children's knowledge of the relation between list length and study time develops first, and is later reflected in their study behavior. However, further research concerning young children's knowledge of the effects of list length and the relation between this knowledge and actual study behavior is indicated.

It must be considered whether the increasing study time across list is serving the same purpose at each grade level. Many of the kindergartners and several of the second-graders simply repeated the names of the pictures aloud during the study period. Thus, in many instances, the increase in study time of the younger children may be a function of the time needed to repeat the names of the increasingly longer lists of pictures. However, the increase in study time of the fourth-graders appears to be due, in part, to a self-monitoring procedure; many of these children looked away from the pictures while repeating the names of the pictures before attempting recall. Thus, the performance of fourth-graders not only demonstrates that they spend more time on longer lists, it also suggests that they monitor the success of their study strategies prior to recall.

Finally, the recall results are consistent with previous research concerning children's recall. Excluding the 5-item list, there is a significant increase in the number of words recalled per list with increasing grade level.

In summary, there are three major findings in the present study. First, kindergartners understand that an increase in the amount of material to be learned requires an increase in study time, and are able to verbalize this understanding. Secondly, children appear to understand the relation between list length and study time before they increase the length of their study periods as list length increases. Finally, the increase in study time of the younger children appears to be a function of the time needed to repeat the names of the pictures, whereas the increase in study time of the older children appears to be due, in part, to a self-monitoring procedure.

Table 1

Frequencies of Correct and Incorrect Prediction and Performance by Grade Level

Grade	Correct	Incorrect	Total
	Prediction		
K	29	7	36
2	30	5	35[a]
4	31	4	35[a]
	Performance		
K	20	16	36
2	21	15	36
4	28	8	36

[a]One subject made errors on the list length comparisons such that they could not be rank-ordered.

Table 2

Frequencies of Correct and Incorrect Performance

by Correct Predictors for each Grade Level

Grade	N	Performance	
		Correct	Incorrect
K	29	16	13
2	30	18	12
4	31	24	7

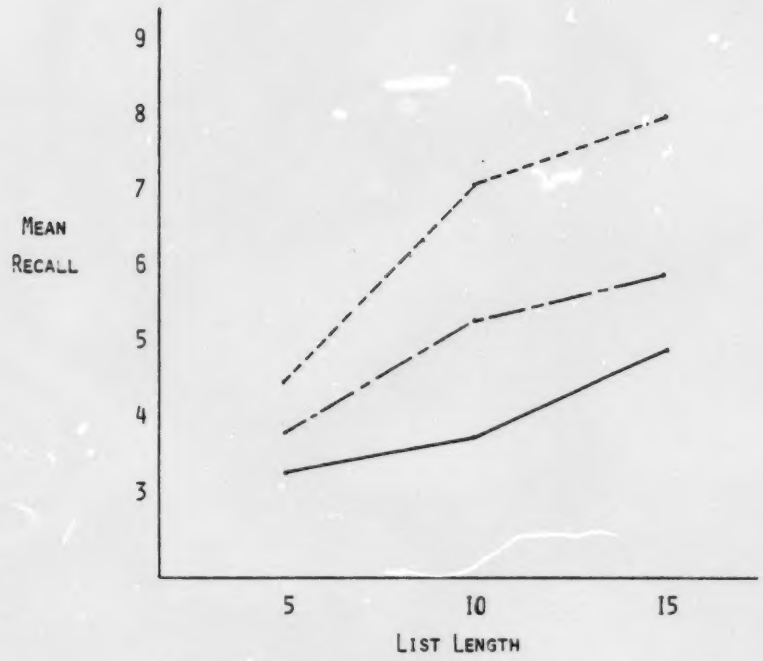

Figure 2. Mean Number of Words Recalled from each List by Grade Level

Kindergarten ——— Second —— — Fourth -----

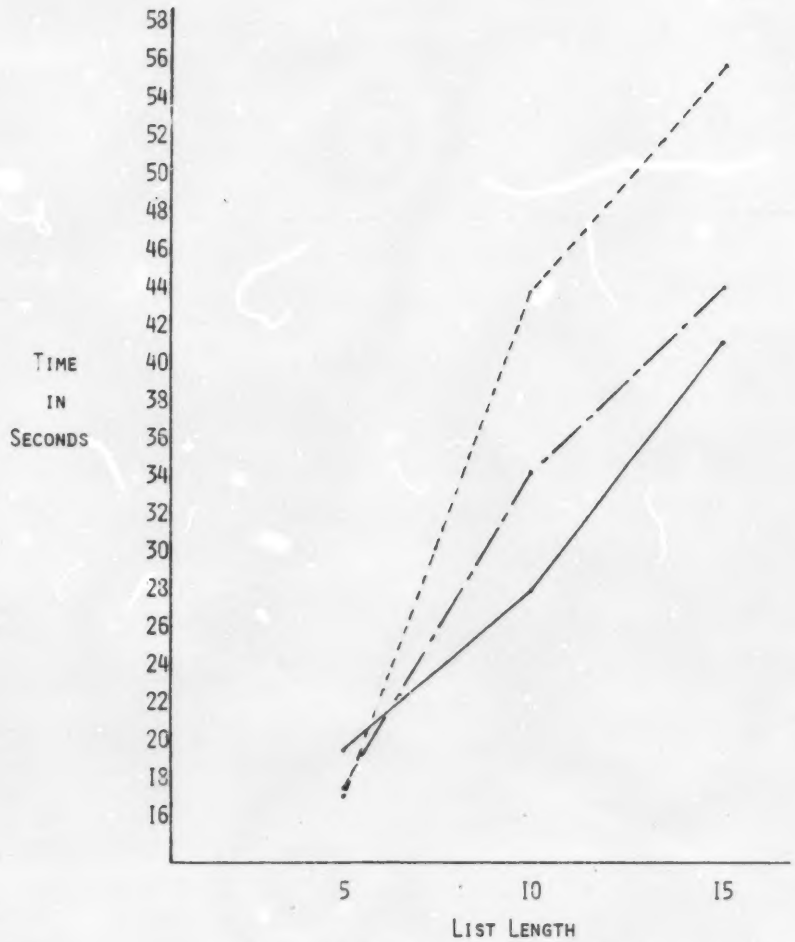

Figure 1. Mean Study Time in Seconds for each List Length by Grade Level.

Kindergarten —· Second——--—— Fourth ----